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COMPARATIVE MORPHOLOGY OF SOFT PARTS OF *PATELLA* L., 1758 FROM THE BAY OF NAPLES (GASTROPODA: PATELLIDAE). (*****)

KEY WORDS: Patellidae, *Patella*, systematics, anatomy, Bay of Naples.

Riassunto

È stata studiata la morfologia esterna delle parti molli delle tre specie di *Patella* presenti nel Golfo di Napoli (*P. caerulea, P. ulyssiponensis* e *P. rustica*). Differenze significative sono state riscontrate nella forma e colorazione del piede, nonché nel pigmento e nella disposizione dei tentacoli palleali; ciò sostiene la validità specifica dei tre taxa. Viene suggerito l'impiego delle parti molli per il riconoscimento sul campo.

Summary

The external morphology of soft parts of the three species of *Patella* living in the Bay of Naples (*P. caerulea, P. ulyssiponensis* and *P. rustica*) was studied. Significative differences were found in the foot shape and colour, as well as in the pigment and the arrangement of pallial tentacles; this supports the specific validity of the three taxa. The use of soft parts for recognition in the field is suggested.

Introduction

The widely distributed genus *Patella* L., 1785 includes about 40 living species from warm and temperate seas (POWELL, 1973; CHRISTIAENS, 1974). The systematics within this genus is mainly based on shell morphology and radular features, while other characters, such as anatomy, biochemistry, karyology, etc., are scarcely known and applied. A modern approach to systematics should be based on multiple different sets of data. Whereas this is widely applied in some groups (e.g. Vertebrata, Insecta), very little has been done about Mediterranean Gastropoda (e.g. COLOGNOLA et al., 1986; GIUSTI et al., 1986; CRETELLA et al., 1990).

The only comparative description of soft parts in different species of *Patella* is given by FRETTER & GRAHAM (1976) on British species; except for radulae (CHISTIAENS, 1974), such data lack for the Mediterranean *Patella*.

In this paper we compare the external morphology of soft parts of the three species of *Patella* living in the Bay of Naples: *P. caerulea* L., 1758; *P. ulyssiponensis* GMELIN, 1791 (= *aspera* LAMARCK, 1819); *P. rustica* L., 1758 (= *lusitanica* GMELIN, 1791).

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(*****) Lavoro accettato il 15 novembre 1990.

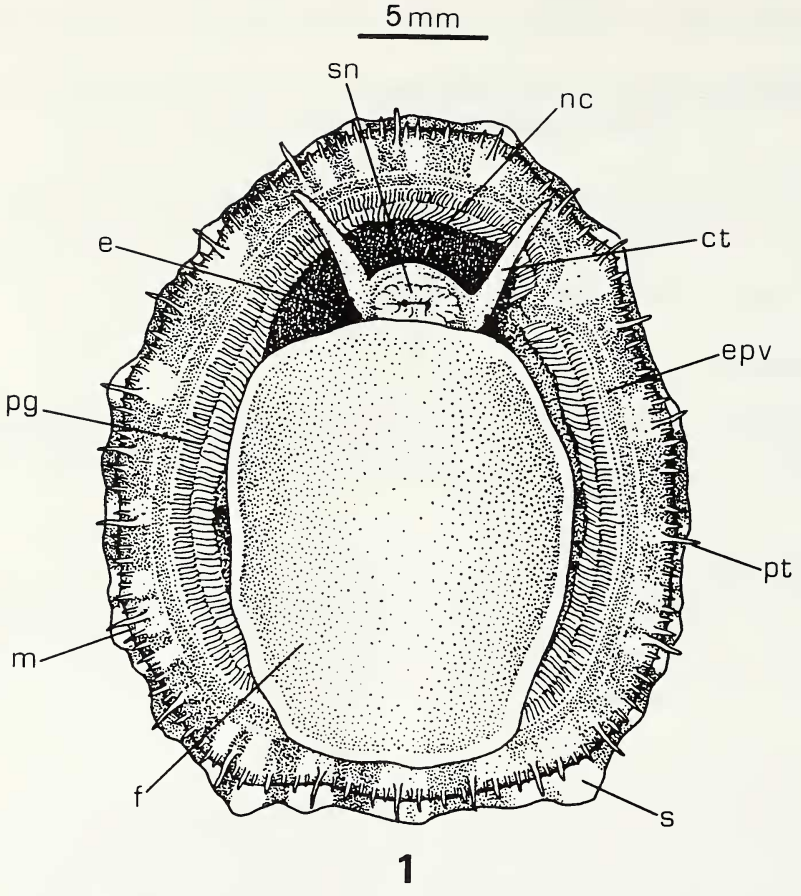

Fig. 1. *Patella caerulea*, animal: ventral view. ct, cephalic tentacle; e, eye; epv, efferent pallial vessel; f, foot; m, mantle skirt; nc, nuchal cavity; pg, pallial gills; pt, pallial tentacle; s, shell; sn, snout.

Material and Methods

The following material was analysed: *P. caerulea* (40 individuals from Vico Equense; 80 individuals from Naples; 30 individuals from Bacoli); *P. ulyssiponensis* (20 individuals from Naples); *P. rustica* (20 individuals from Vico Equense; 50 individuals from Naples; 12 individuals from Pozzuoli).

Each animal was identified on conchological basis (Ghisotti & Melone, 1970) and photographed alive. Because of the high degree of variability of shells (e.g. Ghisotti & Melone, 1970; Christiaens, 1974, 1983), the identification was confirmed by horizontal 10% starch gel electrophoresis of the enzymes malate NADP-dependent dehydrogenase (Me,

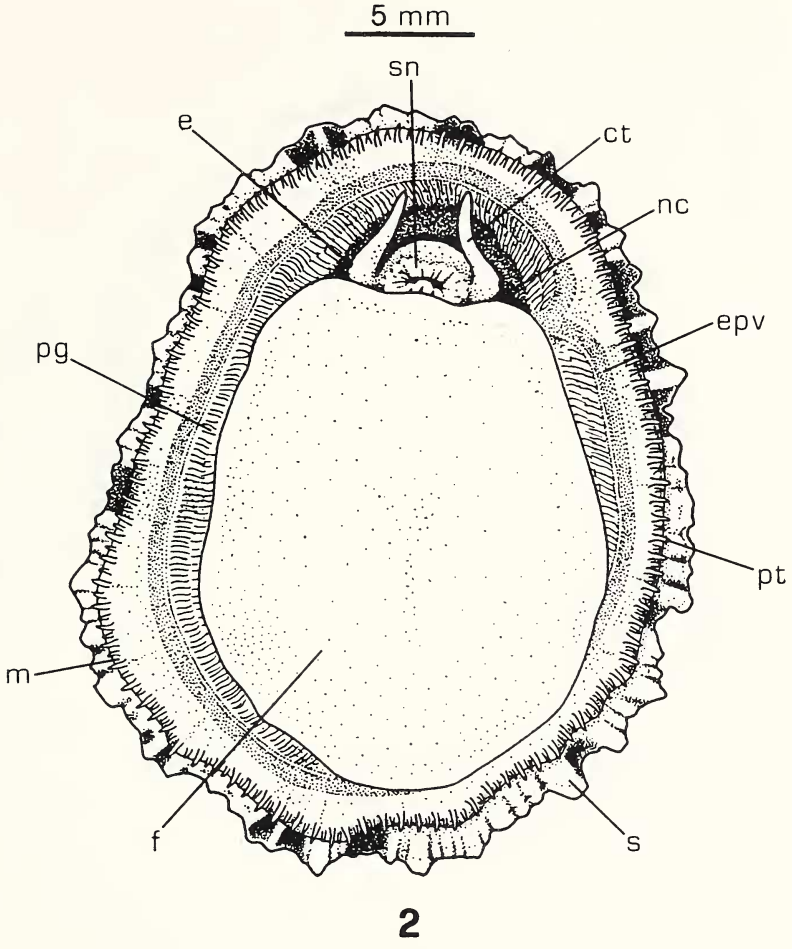

Fig. 2. *Patella ulyssiponensis*, animal: ventral view. Abbreviations as in Fig. 1.

E.C.N. 1.1.1.40) and mannose phosphate isomerase (Mpi, E.C.N. 5.3.1.8); Sella et al. (1989) found that these two enzymes are diagnostic among *Patella* species. A small piece was taken from the centre of the foot of each living animal, and then used for electrophoresis according to Cretella et al. (1990), while the animals were preserved in 70° alcohol. The fixed specimens were subsequently observed by a stereomicroscope at 10-200x, and illustrated by camera lucida drawings. The images so obtained were compared to the photographs of the living animals, re-elaborated, and inked. The systematic nomenclature followed Sabelli et al. (1990) and the anatomical terminology Fretter & Graham (1962).

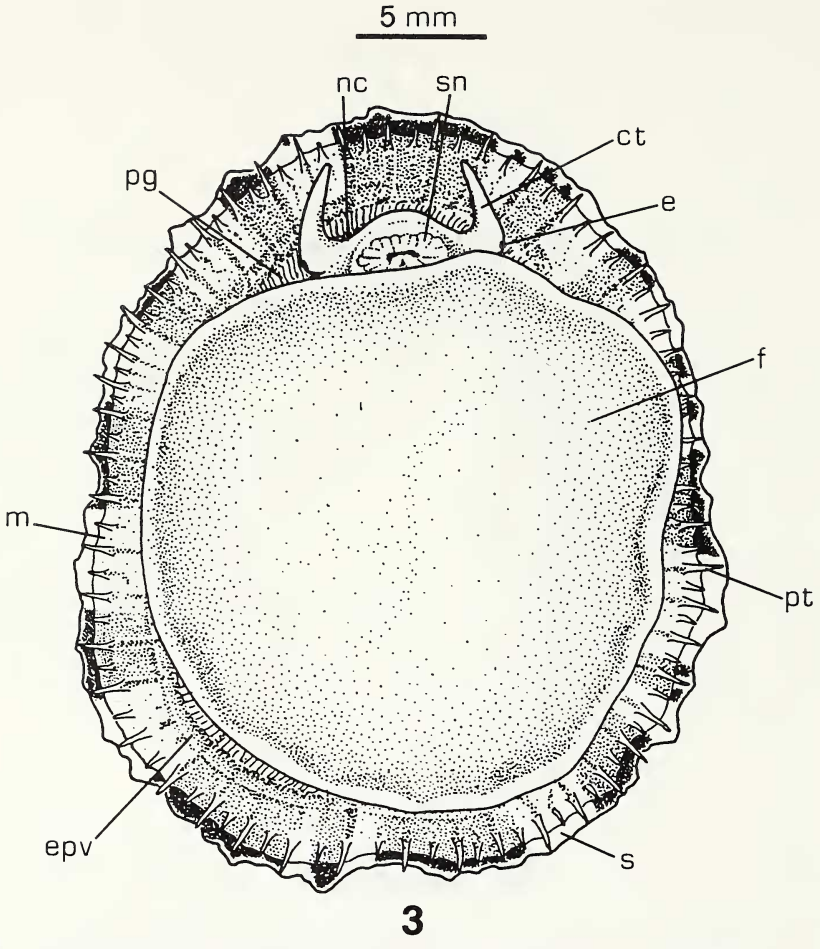

Fig. 3. *Patella rustica*, animal: ventral view. Abbreviations as in Fig. 1.

Results

The conchological analysis identified easily *P. rustica*, while some problems arose in discriminating between *P. caerulea* and *P. ulyssiponensis*. Indeed, the shells of *P. caerulea* showed a wide phenotypic variability that sometimes tended to simulate *P. ulyssiponensis*.

The electrophoresis detected three loci for Me and one locus for Mpi. Me-2 and Mpi always allowed us to discriminate the three species, because each of them had diagnostic alleles; no hybrids were observed.

The animals as seen from the ventral side are illustrated in Figs. 1 to 3. All the species show the typical anatomical features of the genus (Powell, 1973), namely absence of a ctenidium, replaced by a complete cordon of secondary gills (pallial gills), and absence of an epipodial ridge. Similar to the Atlantic *P. vulgata* L., 1758 as described by Davies & Fleure (1903),

Fretter & Graham (1962, 1976), and Nuwayhid et al. (1978), the studied species present a snout curved ventrally, which ends in a truncate surface (buccal disk); the buccal disk edge (lips) is lobed, and each lobe is minutely scalloped. The head bears two cephalic tentacles, each with an eye on the outer side of the swollen base. The foot is large, and has smooth sole and sides. The mantle skirt runs around the shell aperture, with several pallial tentacles lying on its lower surface near the margin. Internal to the pallial tentacles the efferent pallial vessel is situated, which in turn surrounds the cordon of pallial gills. These are set radially, being triangular leaflets of two sizes projecting downwards from the mantle.

The principal differences among the species concern the shape of the foot, the colour of the sole, and the pigment and the arrangement of pallial tentacles; no individuals with intermediate characters were observed. *P. caerulea* (Fig. 1) presents an oval foot and its sole is dark gray or blue with edge and centre cream; the pallial tentacles are white, and arranged in three series of different length: between two large ones, there are five to eight small and medium tentacles, mostly alternate. *P. ulyssiponensis* (Fig. 2) has a pyriform or oval foot and its sole is apricot yellow or cream, with no dark areas; the pallial tentacles are white, and arranged in two series of different length, mostly alternate. *P. rustica* (Fig. 3) shows a circular foot, and its sole is of the same colour of *P. caerulea*; the pallial tentacles are translucent, and arranged in two series of different length, usually alternate. Furthermore, the tentacles appear comparatively longer and more distanced than in the other species.

Discussion

The systematic relationships within the genus *Patella* are matter of debate. A good example is the specific validity of *P. ulyssiponensis*, which several authors (Fischer-Piette, 1938; Evans, 1958; Powell, 1973) regard as a doubtful species. However, data from radular morphology (Fischer-Piette & Gaillard, 1959; Christiaens, 1974), karyology (Cervella et al., 1988), and electrophoresis (Sella et al., 1989) suggest a clear-cut separation between *P. caerulea* and *P. ulyssiponensis*.

Our data show a general agreement among shells, electrophoresis and anatomy in discriminating the three species. No hybrids were observed: even the specimens having shells with mixed characters of *P. caerulea* and *P. ulyssiponensis* were attributed to the former species by the other two approaches. This supports the specific validity of the examined taxa.

The description by Fretter & Graham (1976) of *P. aspera* from British Isles well corresponds to ours.

Since our data indicate that the three studied species are distinguishable at soft part level, the animal morphology is a valid discriminative tool in the field. However, a long permanence in a fixative liquid (alcohol or formaline) seriously alterates the colour and damages the pallial tentacles.

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